Long Distance Commuting in the Mining Industry: Conference Summary

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Edited by
Mark Shrimpton
Keith Storey

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Saskatoon, Saskatchewan

Edited by

Mark Shrimpton
Keith Storey

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Energy, Mines and Resources Canada (EMR) and the Centre for Resource Studies (CRS) are pleased to present a summary of proceedings from their conference, "Long Distance Commuting in the Mining Industry", held in Saskatoon, Saskatchewan, November 26 to 28, 1990.

Long distance commuting to remote mine locations is a growing trend in the industry, both in Canada and abroad. As the Saskatoon conference clearly illustrated, mine operato.s and policy-makers must address a range of unique issues when considering the "fly-in/fly-out" option. It is our hope that the conference, and the papers in this volume, will serve as a valuable guide for all concerned parties.

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Use of long distance commuting in the mining industry requires the resolution of significant logistical issues. Much the same could be said for the organization of the Conference on Long Distance Commuting in the Mining Industry, the proceedings of which are summarized here, as those principally involved were based in Kingston, Ottawa, Saskatoon and St. John's. Much of the credit for the success of the Conference was due to the hard work of Margot Wojciechowski and Mary Louise McAllister of the Centre for Resource Studies, Queen's University, Kingston, Ontario; Glenn Kendall of Energy, Mines and Resources Canada, Ottawa; and Don Somers of Peat Marwick Stevenson and Kellogg Management Consultants, Saskatoon.

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Mark Shrimpton
Keith Storey
St. John's, Newfoundland
April 1991

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1. Introduction

The conference on Long Distance Commuting in the Mineral Industry, sponsored by the Centre for Resource Studies and Energy, Mines and Resources Canada, was held with the principal goal of examining issues associated with the use of this relatively recent and increasingly common system. This introduction outlines the goals and objectives of the conference and those in attendance, and provides a brief review of the contents of the sessions and individual papers. It is followed by summaries of all presentations. A full list of conference participants is provided in an appendix.

Long distance commuting (LDC), which is also known as "fly-in" or "fly-in/fly-out" mining,[1] sees workers spending some days or weeks at the minesite, working long shifts and living in a workcamp, followed by a similar or shorter period spent at their homes. The employer pays some or all of the commute costs. The costs may be considerable, with commutes of hundreds and thousands of kilometres being common.[2]

The main objectives of the conference were to share and expand the knowledge base about LDC mining. The need for this was reflected by the gaps in the information available on the use of the system in Canada.[3] Table 1 provides a summary of information about Canadian LDC mines; it is based on a table presented at the conference by Storey and Shrimpton but also includes a number of additional operations identified during the conference itself.

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1 The term "fly-in" is inappropriate given that there are now mines which use sea and road transportation to move their employees to and from the mine.

2 However, there are also operations which involve a commute of less than 100 km which, but for the use of extended workdays, would be feasible as a daily commute. In this regard the term "long distance commuting" may be an inappropriate descriptor of this work system. Other terms which have been suggested include "commuter" or "residential" mining.

3 Thus, for example, a 1987 survey collected information with respect to the operations at thirteen Canadian LDC mines. However, none of the respondents, who were asked to identify LDC mines additional to those listed on the questionnaire, knew of the Lac Shortt mine in Quebec, which opened in 1984.

Table 1. Characteristics of current and former Canadian mines using LDC

Mine	Minerals	Province	Opened/ Closed	Number of LDC Employees	Rotation Days In/Out	Years of Expected Life
1. Asbestos Hill	asbestos	Que.	1972/83	400	70/14	-
2. Rabbit Lake	uranium	Sask.	1975	350	7/7	>20
3. Coal Valley	coal	Alta.	1978[1]	335[2]	n.a.	n.a.
4. Cluff Lake	uranium	Sask.	1980	260	7/7	>20
5. Camsell River	silver	NWT	1980/85[3]	200	28/28[4]	-
6. Baker River	gold	BC	1981/83	47	14/6[5]	-
7. Lupin	gold	NWT	1982	448	28/14 14/14	15-19
8. Polaris	zinc, lead	NWT	1982	275	63/21[6] 42/28	15-19
9. Cullaton Lake	gold, silver	NWT	1983/85	130	7/7 42/21	-
10. Key Lake	uranium	Sask.	1983	425	7/7	15-19
11. Detour Lake	gold	Ont.	1983	350	7/7[7] 4/3	10-14
12. Salmita	gold	NWT	1983/87	25	14/14[8] 35/21	-
13. Lac Shortt[9]	gold	Que.	1984	183	14/7 7/7 5/2 4/3	1-3

14. Star Lake	gold	Sask.	1987/89	45	7/7	-
15. Hope Brook[9]	gold	Nfld.	1987	273	14/14 4/3	7-9
16. Emerald Lake	gold	Ont.	1988	85[10]	4/4	n.a.
17. Golden Patricia[9]	gold	Ont.	1988	192	14/14	4-6
18. Golden Bear[9]	gold	BC	1989	111	28/14 14/14	4-6
19. Johnny Mountain[9]	gold	BC	1989	133	28/14 14/14	1-3
20. Colomac[9]	gold	NWT	1990	342	14/14	n.a.

1 Workers were bused in 5 days per week for 8-hour shifts from 1977-78. A daily helicopter commuting system was used 1978-82 with workers rotating on a four-days-in/four-days-out (4/4), 12-hour shift system. Since 1982, the company has used a daily bus commuting system, but workers still rotate on the 4/4, 12-hour shift system.

2 1986 employment which was about 60 percent capacity.

3 Operations began in 1970, but a rotational system was not adopted until 1980.

4 The original rotation was 54/30 for hourly workers and 36/20 for staff. In 1984 the rotation changed to 28/28 for all employees.

5 1981 rotation for all personnel was 21/7. This changed in 1982 to 14/7 with the exception of administrators, who remained on 21/7.

6 Majority of hourly paid and corporate staff work 63/21; native workers can opt for 42/28; senior management staff work 42/21.

7 Mine staff work 3 weekdays first week, 4 days second week at mine site, except accounting personnel, who are located in Timmins.

8 Mill workers worked 14/14, production employees worked 35/21.

9 Data are from a 1989 survey. Data for all other mines are from a 1987/88 survey.

10 Of the total workforce, 55 will commute on a daily basis from River Valley and area, the remaining 30 will live on site during their 4/4 rotation, or 4/3 rotation in the case of mill operators.

While the use of LDC in the Canadian mining industry began at Asbestos Hill in Quebec in 1972, 17 of the 20 operations identified have been in production or under development only since 1980, and eight have been developed since 1987. Gold mines (twelve) have dominated; all new operations since 1983 have been gold mines. However, the development of uranium (three), zinc/lead, asbestos, and coal (one each) mines illustrates that LDC operations need not be limited to small-volume high-value minerals. While in an overall sense the use of LDC in the mining sector may be considered relatively limited, the increase in its use has been rapid, and in some regions, such as the Northwest Territories and northern Saskatchewan, it has become the dominant approach to new developments for metallic minerals in particular.

Although Canada is a major user of LDC, there are many other such operations in the world. There are currently 18 in Western Australia alone. The rapid growth and resultant issues of LDC in Australia formed the basis of a presentation by Rex Whiffen. Other non-Canadian operations discussed at the conference included the recently closed Black Angel mine in Greenland (Willson) and the newly opened Red Dog mine in Alaska (Hopkinson). There are other LDC mines in Louisiana, Brazil, Chile, Columbia, Indonesia and Papua New Guinea. In his paper, Chris Hinde identified a number of reasons for the increased use of LDC worldwide.

Given the increasing importance of LDC, the focus of the conference was to examine the implications for the industry, unions, workers and their families, and for regional and community development, and to compare approaches on how best to manage these operations. The 59 conference participants (listed in the Appendix) included 23 mining industry personnel, including representatives of companies operating or developing twelve Canadian LDC mines; 15 representatives of federal, provincial and territorial governments; 8 representatives of academic institutes and departments; two people from the aviation industry; one union representative, a local business representative, the operator of an LDC mine employee assistance program, and an Editorial Director of the *Mining Journal*.

Of these participants, three were from Australia, three from the United States and one from England. Twelve of the participants participated in a pre-conference field trip to Cameco's Key Lake uranium mine in Northern Saskatchewan.

The first session of the conference provided an *Overview of Major Issues* (Storey and Shrimpton) and an analysis of the economic basis of LDC (Lightfoot). This was followed by a session which focused on three major *Logistical Issues* associated with the use of LDC: safety (Gould), rotations and shifts (Hopkinson), and aviation services (Loberg).

The speaker at the first luncheon, John Willson, described the development and operation of the Black Angel mine in Western Greenland. Opened in 1972, this mine provided a model from which Cominco developed the operating procedures subsequently used at its other Arctic mines, Polaris (NWT) and Red Dog (Alaska).

The afternoon started with a session on *Workforce Issues*, summarized by Mark Shrimpton and Keith Storey. Presentations were heard on employee assistance programs (Coates), workforce issues at the Cluff Lake (Saskatchewan) mine (Gitzel), and the concerns of organised labour (Stevens) and natives (Hanson).

The next session, while focusing on *Community Issues*, covered a broad range of topics. This included a review of the history of Canadian resource communities (Robson), a description of the rotational system adopted by Hydro Québec for the James Bay project (Allard), a review of federal government community development initiatives (Donnelly) and a discussion of the potential effects of LDC on families and particularly on the wives of the miners (Bray).

The evening provided two *International Perspectives*. Rex Whiffen, Executive General Manager of the Australian Mines and Metals Association, reviewed Australia's experiences with LDC and its impacts. Chris Hinde, Editorial Director of the *Mining Journal*, presented an analysis of global mining trends and why they favour increased use of LDC.

The second day of the conference commenced with the final panel session, presenting *Canadian Case Studies*. These examined the use of LDC at the Hope Brook gold mine in Newfoundland (Fotheringham), the Cameco uranium operations (Rabbit Lake and Key Lake) in Saskatchewan (Babcock), and Echo Bay's Lupin gold mine in the Northwest Territories (Armstrong).

The Cameco operations and the Cluff Lake uranium mine were also the focus of the presentation by Ray Clayton, Deputy Minister, Energy and Mines Saskatchewan, who also considered the impacts of LDC on nearby communities and issues influencing the decision between the use of LDC and a daily commute.

The conference concluded with three workshops and a plenary presentation on their findings. The workshops looked at *Community and Public Policy Issues*, *Human Resources Issues*, and *Planning and Operating an LDC Mine*. They provided an opportunity for in-depth discussion of issues raised during the conference and an exchange on experiences, policies and practices. The findings of the workshops were then summarized at the plenary session.

The presentations and workshops identified a number of emerging themes, common characteristics and issues associated with LDC. These can be summarized under four main headings: the nature of LDC, the growth in its use, its changing characteristics, and management issues.

It is clear that LDC is not a new phenomenon, since Canadians and others have always had to travel to mining projects to work. Rather, it represents a new variant on an old theme, one characterized by a highly organized and regularized system of labour movement and work organization. This has produced a new set of constraints and opportunities for companies, governments, workers, their families and organized labour alike. These challenges have resulted in a variety of innovative responses by industry, workers and families, and, to a lesser extent, by governments and organized labour.

A second feature of the commuter mining phenomenon is that it may not always involve "long distance" commuting. While the majority of LDC systems involve the movement of personnel over considerable distances, commuting is an option whenever the time and cost of daily travel from the place of residence to the place of work become uneconomic or impractical. For example, it is unrealistic to combine a workday of ten or more hours with a daily commute where total journey-to-work time exceeds two hours. Thus, in the case of Cameco's proposed Contact Lake mine near La Ronge, a daily commute is considered the preferred option by the community, while Cameco would rather use a 7/7-day rotation (see Clayton). Increasingly, the complex relationships among length of work day, labour and commute costs, labour supply, productivity, and other key variables have come under careful scrutiny, and it appears likely that commuter mining will become more common for a greater range of distance conditions.

This reflects the consensus of those at the conference that, for a variety of reasons, there are likely to be further increases in the amount of commuter mining, as has already been experienced in Australia. As a result of trends in mineral economics and increased experience with LDC operations, the system is no longer seen as an option solely for high-value small-size short-life-expectancy operations.

However, growth in the use of LDC is likely to bring its own problems. Among the perceived disadvantages of the system are the leakage of employment and business effects out of the region where the mine is located. While this has yet to become a major issue in Canada, it has become so in Western Australia, where the commuter workforce in the minerals and energy-related sectors now exceeds 4,000. As use of LDC grows in Canada, there will undoubtedly be greater demands that economic benefits remain within the host region.

Industry experience with LDC has led to a number of changes in its characteristics. First, the rotations are getting shorter. Notwithstanding arguments in favour of long rotations, the trend is towards a reduction in the number of days spent on site. Secondly, the composition of the workforce has changed, and will likely continue to do so. In Saskatchewan, in particular, there has been an increase in the employment of native workers and in training and business-related programs to facilitate this. The proportion of

women at LDC operations has grown, and is likely to continue to grow as attitudes toward women in the workplace evolve, and as mines managers recognize the benefits of making the work environment more home-like.

Making the work environment more home-like requires considerable investment in physical infrastructure and in human resource policies and programs. High-quality accommodations, food and amenities are essential, but must be accompanied by initiatives which respond to the social and family life impacts of LDC. These include recreational programming, worker and family counselling opportunities, and sensitive transportation policies. Additionally, screening and pre-employment orientation programs can yield significant benefits to the company and the prospective workforce by reducing labour turnover and work-related stress.

In terms of management, the role and influence of the mine manager together were seen as the key element. The consensus was that, while each mine presents unique developmental and operational challenges, and there are no simple solutions to ensuring effective management, the part played by the mine manager is crucial. Above all, managers must be innovative and flexible, particularly with regard to attitudes towards work organization and labour relations. Similar flexibility is also required from governments, for instance with respect to hours-of-work legislation, and from unions, in terms of recognizing the real priorities of LDC workers and their families.

2. Setting the Context

Long Distance Commuting in the Mining Industry: An Overview

Keith Storey and Mark Shrimpton

LDC in Canada began with the Asbestos Hill operation in northern Quebec in 1972; the most recent is the Colomac gold operation in the Northwest Territories (NWT) that came on stream in 1990.

The decline in the construction of new towns and the growth in the use of LDC is a function of several factors:

- the limitations of resource towns, which include high start-up and wind-down costs, lack of economic diversity, and the social and economic problems associated with closure;
- more stringent requirements in the regulatory and policy environment with respect to physical and social planning and affirmative action;
- technological and infrastructural changes, particularly with respect to air transportation improvements;
- restructuring in the mining industry designed to improve productivity and reduce production costs;
- changes in worker and family attitudes, with many preferring to commute rather than live in remote communities.

The implications of the increasing use of LDC can be examined in terms of management and labour issues, worker and family life matters and regional development policy.

Management issues include the question of the optimum length of rotation and shift cycles, the implications of different cycles for worker health and safety, and the scheduling of cycles to ensure management continuity. Rotations have tended to become shorter over time for a variety of reasons related to productivity and to health and safety; however, the question of

maintaining continuity in the operation remains an ongoing issue. Shift lengths have tended to increase, toward 12-hour shifts, but the implications of the extended work day and different rotation patterns are not well understood.

Relatively few LDC mines are unionized, possibly because organizing labour and implementing industrial action in such circumstances is clearly difficult, and also perhaps because very few LDC-related disputes have resulted in industrial action. From a management perspective, the remote locations of LDC mines mean that the organizational requirements for a successful operation are significantly different from those of a mine with a conventional associated town. The evolution of new management styles appropriate to the circumstances may also have contributed to improved labour-management relations.

From the company perspective, the choice between a new town and a commute operation is primarily a function of cost. LDC operations have significantly lower start-up costs, but operating costs, particularly transportation costs, are significantly higher. Thus the decision becomes a complex one based on a set of variables that includes the size of the labour force, life expectancy of the mine, type of operation (e.g. unit value of final product), location relative to centres of population, and government policy. In practice, there appear to be few constraints to LDC; the economics increasingly favour the system, even in non-remote situations where the mine location is just beyond a feasible daily commute.

From the perspective of workers, the advantages of LDC include the opportunities to earn a good income and spend extended periods with families, while their families can enjoy the opportunities and facilities of the home community. The disadvantages include the extended periods away from the family, the difficulties of maintaining ongoing relationships within their home communities, and the stresses of partings and reunions. Some of the negative aspects of separation can be addressed through relatively simple measures, such as good communications between the workplace and the home, but for many a commuting lifestyle will always be difficult.

Only limited research has been carried out on the regional development implications of LDC. On the negative side, there is the use of non-local labour, the limited involvement of Aboriginal workers, and the loss of local economic benefits resulting from purchasing practices which see goods and services being supplied from metropolitan areas to the south. On the other hand, LDC results in minimal disruption of both the physical and socio-cultural environments, allows workers to live in the area of their choice relatively unconstrained by the location of the place of work, and enables Aboriginal people to participate in the "white" workworld without sacrificing many of the elements of their traditional lifestyle.

Opportunities for mining in Canada over the next decade and longer are likely to be found away from existing mines and settled areas; this favours the

use of LDC. Changes in absolute and relative costs, particularly with respect to transportation and new town construction, and changes in attitudes toward work and well-being on the part of workers, their families and management, in an environment where the supply of skilled labour is shrinking, all point to the increased use of LDC.

Air Commute Economics: The Process

Norman Lightfoot

The alternative to creating a new town near a "remote" operation (i.e. one beyond a feasible daily commute from an existing community) is to establish a commuting system from one or more well-established communities. The main incentives for considering the commuting alternative include a significant potential reduction in capital costs and improved quality of life for employees. The developers of most of the remote mineral development projects now routinely investigate the feasibility of air commuting.

The primary controlling conditions in the economic decision of whether or not to use a commuting system are the project size, the project length, and political factors. Contrary to popular belief, the distance of the commute can be shown to be largely irrelevant. Furthermore, the economics of commuting is generally insensitive to the life of the project, at least for projects with lifespans greater than 12 years.

Determining the economics of an air commute system involves five inter-related tasks: analyses of requirements, operations, equipment and economics, which together provide an estimate of capital investment and annual costs, as input into the overall financial analysis of the proposed operation.

An analysis of requirements involves an examination of the organization dimensions (including total number of employees and air-commuting employees) and roster and shift dimensions (including roster or rotation length and shift length). This allows the generation of roster and shift alternatives and the creation of roster panels and crew rotation schedules for each alternative. Consideration of cargo requirements provides an overall indication of capacity requirements.

Operations analysis involves consideration of frequencies, itineraries and transit times to generate schedules, which in turn provide input into aircraft class and facility/maintenance requirements. Based on equipment needs, the equipment requirements analysis includes an examination of candidate aircraft, landing area characteristics, flight route data and reserve requirements to determine route capability and performance costs.

These data on aircraft operations and maintenance costs and payload- and system-related costs are the basis for determining annual costs which, together

with capital investment requirements, provides input on the commute system into the overall financial analysis of the project.

Air commuting is not a new or novel concept. Initially, it was an extension of operations mounted during the exploration and development stages of mineral properties. It is now used successfully by a number of companies, particularly in Australia and Canada, for mineral production. For example, the decision to use air commuting, rather than proceed with the construction of a new town, is estimated to have saved the Argyle Diamond Mine in Western Australia A$50 million in capital investment.

While other factors, particularly industrial relations issues, will influence decisions as to whether to proceed with the air transport alternative, the potential for capital investment savings associated with air commuting is a compelling argument for the adoption of this strategy for remote operations.

3. Logistics Issues

Health and Safety at Long Distance Commuting Mines

Lloyd Gould

The impacts of LDC mining on health and safety are not yet clear. A 1988 study commissioned by the Government of the Northwest Territories failed to identify any significant relationship between rotational work patterns, the extended work day and health and safety. Data for three LDC mines (Lupin, Colomac and Polaris) and three mines in mining communities (Nanisivik, Nerco, and Giant) illustrate the recent situation (Table 2). The sources of difficulty in drawing conclusions about the role of LDC and the extended workday from these rates include the variability of rates from year to year, differences in the reporting measures from mine to mine, the age of the mine, and the various labour and management systems at different mines.

Another unresolved issue particular to LDC operations is whether accidents appear to follow any pattern during the rotation. One hypothesis is that accidents may be more prevalent at the beginning and end of rotations, as workers re-adjust following their time away and then anticipate leaving at the end of their schedule. Data from Polaris do not support this. There are no clear patterns. If anything, the data suggest that accident rates decrease after the start of the rotation, increase during the middle period, and decrease again towards the end.

The implications of rotational schedules and the extended workday are not well understood. Issues such as differences in exposure periods have not received very much attention. If health and safety in the LDC mines is to be maximized, these issues need further attention.

Long-Distance Commuting: Rotations and Schedules

John Hopkinson

Cominco has had experience with four mines located in remote areas where there is no local workforce and to which everybody commutes:

Table 2: Accident Rates by Frequency and Severity, NWT Mines 1987-1990

Mine	1987		1988		1989		1990[1]	
	Fr.[2]	Sev.[3]	Fr.	Sev.	Fr.	Sev.	Fr.	Sev.
Lupin	11	570	21	7,246[4]	7	300	17	353
Colomac[5]	-	-	83	-	17	69	7	196
Polaris	8	508	22	16,178[6]	14	1,009	14	1,205
Nanisivik[7]	32	982	49	383	54	1,479	46	615
Nerco	23	1,940	34	1,155	92	2,079	107	1,635
Giant	98	1,146	83	1,157	124	3,157	91	1,996

1 To October 31, 1990
2 Frequency = Lost time accidents per 1 million person hours worked
3 Severity = Workdays lost per million person hours worked
4 Includes one fatality
5 Construction began in 1988; operations began in 1990
6 Includes two fatalities
7 Nanisivik is partly LDC but mainly a minetown operation

- Black Angel Mine, Greenland, located at 71 degrees north, 2.5 hours by helicopter north of Sondre Stromfjord and accessible by sea about three months per year. This mine was sold over five years ago;

- Polaris Mine, NWT, located on little Cornwallis Island at 76 degrees north, half an hour by Twin Otter out of Resolute and accessible by sea about two months per year;

- Red Dog Mine, Alaska, located at 68 degrees north. Reached by charter flight from Kotzebue (40 minutes) or Anchorage (1.5 hours) and accessible by sea about three months per year;

- SNIP Mine, British Columbia, located at 58 degrees north. Reached by charter 1.5 hours out of Smithers or by hovercraft about two hours out of Wrangell.

Establishing the work schedules and rotations for each operation required an evaluation of a number of competing factors to achieve the best compromise for the employer and employee. The following were the major factors considered:

- separation of employees from family, friends and amenities;
- earnings potential for employees;
- employee expectations;
- payroll costs for the employer;
- on-site accommodation and entertainment;
- accommodation, food and service costs;
- employee safety and productivity;
- operating efficiency;
- training costs;
- labour source and supply;
- transportation costs;
- hours of work and pay legislation;
- total operating costs versus revenue potential.

The result was a combination of rotations and shift schedules at each mine. For example, Black Angel operated on a 6-day week, 26 weeks in and 4 out, and 17 weeks in and 4 out. Employees worked 10- or 12-hour shifts, depending on their tasks. At Polaris the systems are 6-day weeks, 10/6-, 6/4- or 6/2-week rotations, with shifts of 11 or 12 hours. At Red Dog and SNIP, we use a 7-day week, a 4/2-week rotation and 10- or 12-hour shifts. If a "normal" 5-day work week with 8-hour shifts is taken as a base of 100, the comparative annual earnings potential resulting from these rotation and shift

schedules ranges from 152-191 at Black Angel, 119-176 at Polaris, 139-174 at Red Dog and 143-183 at SNIP.

Sixteen years of operations at Black Angel, nine at Polaris and a year at Red Dog have provided considerable experience with LDC. Extended separation from family and society is not for everyone. For some the earnings potential is a powerful incentive and adequate compensation for the isolation involved. However, after two to four years, this group is looking for another job. Others, who enjoy the lifestyle of a remote location, are willing to stay much longer.

Two of our findings with respect to the work schedule are worthy of particular note. One is that, in our experience, the six-day week is preferable to seven days. While the option to work on the seventh day is there, the ability to take a day off helps combat "cabin fever". Second, it is of great importance to do everything possible to minimize the risk of delays on the fly-out schedule. Weather in the north can be very uncooperative, and a delayed flight can have a very stressful impact on the employees involved, even on the shortest rotations.

Until the mining industry can develop the type of human transportation depicted in "Star Trek", we will have to continue designing compromises that will compensate employees adequately in cash, work and service, at a level that justifies the capital expense required to convert an interesting geological anomaly into an operating mine.

Air Transportation Issues

Carmen Loberg

Time Air is a Canadian regional airline with considerable experience of fly-in operations. Norcanair, which was subsequently bought by Time Air, served the Collins Bay uranium operations in northeastern Saskatchewan from the mid-1970s onwards. Time Air now provides services to three Saskatchewan uranium mines: to Key Lake and Rabbit Lake every weekday and to Cluff Lake twice a week. Time Air also flies workers to and from the Lawyers Property mine in British Columbia.

This work has to be integrated with scheduled Time Air services, which can pose various logistical and other problems. Mining companies often want the newest and fastest equipment (e.g. a Dash 8 rather than a Convair 580), but this equipment is also much in demand for other operations. Scheduling may also be complicated by the fact that the mine and some pick-up points may be able to handle only daytime arrivals and departures.

However, developments in the airline industry make the alternative, corporate aircraft ownership, increasingly problematic. Aircraft are getting

more expensive (a 54-seat Dash 8 costs about $12 million) and it is difficult to attract technical expertise, including pilots, to corporate aviation.

There are two main operational issues from an airline's perspective: ground support and human factors.

Ground Support: Airlines are at the mercy of the mine owner in terms of ground support (e.g. terminal, navigation, and de-icing equipment) at the "north end". Mining companies increasingly want to provide only labour support and runway maintenance. However, airlines are not keen to get involved in the provision of ground support, especially in an increasingly litigious environment.

Human Factors: LDC miners become "expert" and demanding passengers. It is important to recognize and respond to this. In one case, a change of aircraft led to mechanical problems and an erosion of worker confidence. Time Air initially dealt with the mechanical problem but not the human side of the issue. This was later addressed by "bearpit" sessions with workers at the minesite. These sessions were very productive and made it clear that many employees are apprehensive about flying. Such issues must be considered and dealt with by airlines and mining companies involved in fly-in.

Workforce Issues at Cluff Lake

Clare D. Gitzel

The 1978 Surface Lease Agreement for developing the Cluff Lake uranium mine in Northern Saskatchewan contained a socio-economic component. Under this agreement, the mine was to aim for a 50 percent Native workforce in four years. It was required to provide transportation to and from five northern pick-up points, an apprenticeship program, and continuous training to upgrade Native skills. Amok has been successful in maintaining more than the required level of Native participation.

While the seven-days-on/seven-days-off schedule allows people the best of both worlds, it is important to have an orientation program to educate workers – to attendance, among other things. There are now 65 northern employees with an average of eight years of service.

Diet is an important issue associated with the employment of a Native labour force. It has been necessary to add country foods (fish and game) to the original "white" diet, which caused digestive problems for native employees.

Overall, the cost of using LDC is $3.00 per employee per hour for flying, and $2.50 to $3.00 per employee per hour for accommodation and other costs.

Transportation must be safe and dependable. Amok looked at providing company-owned air services, but charters, through Norcanair and then Time

Air, proved preferable. A sharing of aviation services with other LDC mines is under consideration. Dependability is a key issue because of the wage costs of delays, which also cause worker stress. Amok workers are very experienced and demanding "professional" flyers.

Accommodation facilities provide single rooms (shared with another person who works the cross shift) and a wide range of recreational opportunities, including a gym, curling rink, golf range, photo club, computer club, fishing and licensed bar. The bar is open for two hours both morning and evening, and is run by the employees' recreation club.

Human resources personnel, including a Native-speaking personnel assistant, are on-site at all times.

4. Long Distance Commuting in the Mining Industry: Lessons from Greenland and Northern Canada

John M. Willson

Experience in Greenland and northern Canada provides a number of lessons for any mining company setting up a long distance commuting or "fly-in/fly-out" operation. This presentation summarizes these lessons with respect to rotation lengths, accommodations and catering, classes of employee, families/spouses, and alcohol and drug abuse.

The rotations should be as long as possible, for a number of reasons:

- transportation costs are reduced. At the Black Angel Mine (Greenland) workers made 2.5 trips per year, compared to 8.5 planned for Cominco's new Red Dog operation in Alaska;

- teamwork is better. Black Angel used an asymmetrical four-month-in/one-month-out schedule. This led to a greater need for cross-training, but there were no wrenching complete crew changes or duplication of key supervisory positions. There is also a much greater sense of "team" at long rotation mines;

- productivity is immensely improved. Compared to Red Dog's four-week-in/two-out schedule, Black Angel had only half as many rotations per year. This is important because productivity is lower at the beginning and end of each rotation, as people adjust to their return and anticipate their departure. The duration of these low productivity periods will decline only for the shortest rotations, and even then they are still significant;

- accountability increases with longer stays, since there are few benefits from procrastinating; the work will not be handed over to someone else in the short term;

- employee happiness and stability are enhanced. Short periods away from the site do not give a real opportunity for a break.

The rule with respect to accommodations and catering is to do it a lot better than you think you can afford. The incremental cost of larger and better accommodations is very low indeed. The key is to provide space and quality which reduces cabin fever and maintenance. Good, well-maintained accommodations will be respected and cared for. The effect on morale is not measurable but it is significant, paying off in terms of increased productivity and reduced turnover. The same goes for catering: provide excellent and spacious kitchens and storage areas. They are almost always designed undersize and have to be upgraded later, at greater cost and operational disruption.

Experiences at the Black Angel and Polaris mines show that it is important to make all classes of employee as equal as possible. Stresses on senior management are offset by better accommodations and greater diversity of job content.

The industry's acceptance of female workers has been a great success. The presence of women has enhanced all aspects of life at remote mines, improving morale, safety, productivity, cleanliness and language, and opening up a whole new qualified labour force. This will be an important feature of successful remote operations in the future.

At Black Angel, both strict prohibition of alcohol and southern-style access to it were tried. However, eventually a compromise was found to be best, with rationing and controlled distribution in a bar and restaurant environment. Polaris also moved from prohibition to controlled access, and I believe that moderate use of alcohol is acceptable and sometimes even desirable. Excesses must, however, be controlled.

In conclusion, operators will certainly find long distance commuting substantially better than the mining town option. For governments, it avoids all the trauma that goes with an experience like that of Pine Point.

5. Workforce Issues

Labour Force Issues at Long Distance Commuting Mines

Mark Shrimpton and Keith Storey

This paper examines eight key labour force issues at LDC mines. However, it is useful first to review the characteristics of Canadian LDC workers and their attitudes towards the system. Most Canadian LDC workers are married, non-Native males. Sixty-seven percent are married, 27 percent single and 6 percent widowed or divorced. Only 18 percent are Native and only 8 percent are female. A minority (31 percent) of LDC mines are unionized, but these are generally larger operations and account for 38 percent of all LDC miners. In terms of place of residence, LDC workers live mainly in larger southern cities; relatively few live in the North. About a quarter of respondents to a survey of Key Lake and Polaris miners and their spouses had an overall negative evaluation of the system's impacts on their lives, and about 60 percent had some negative responses. In both cases, spouses were more negative than miners. About a third of all respondents who had experienced both LDC and mining-town life preferred the latter.

Eight labour force issues seem to be of particular importance in determining levels of worker and spousal satisfaction with the system.

- Rotations and shifts: workers seem generally content with 14/14-day and shorter rotations, with increased dissatisfaction with longer cycles. There are also safety concerns about long rotations and shifts, but the evidence is inconclusive. The pacing of work may be critical.

- Transportation: time spent getting to and from the mine is resented as "wasted". Some mines (e.g. Polaris and Hope Brook) make a travel-time payment. Reliable transportation is greatly valued, as are clear and generous policies to get workers home in the case of domestic emergencies.

- Communications: workers view an equitable provision of private and inexpensive telephone links with their homes as a very high priority.

- Accommodations: workers value quality accommodations and food, especially when they provide an unregimented and "homelike" environment. A variety of active and passive recreational opportunities, and accommodations which cater to the needs of women and couples, are appreciated. With respect to alcohol, camps range from being totally dry to having employee-operated taverns. The former seems to be becoming increasingly rare.

- Hiring and orientation: this is not important as such to workers. However, it may be possible to select out, prior to hiring, employees who will not be able to deal with the system. Two main options exist: psychological testing and self-selection. The latter provides information on the benefits and costs of the work (including for family life). In both cases, spouses should ideally be involved.

- Counselling: LDC is recognized as being commonly more stressful than other work systems, and formal counselling mechanisms (preferably an Employee and Family Assistance Program, or EFAP) should be provided.

- Family services: impacts on families, which rebound on miners and their employers, have been addressed by such initiatives as hiring couples, site visits, special Christmas arrangements, EFAPs, subsidized and private telephone links, and social events for families.

- Management style: overall, the system requires an innovative and flexible management style which includes a willingness to consider and address the types of issue identified above.

Counselling Requirements at Long Distance Commuting Mines

Dennis Coates

The particular stresses associated with LDC work are widely acknowledged. They are related both to the intensity of the period of work at the mine, and the regular transition which has to be made between work and home. The latter also has direct, and the former indirect, impacts on the worker's family, and concerns about them will affect work performance at the mine.

These areas of stress can be moderated through sensitive management policies, but the fact still remains that counselling will often be required. In the absence of formal approaches, many workers will find an outlet through discussing their concerns with fellow workers or a nurse, especially if they are

female. Most nurses at LDC or similar operations find that such informal counselling consumes a major part of their time.

This is a problem in and of itself, as is the fact that providers of informal counselling are seldom trained and may not recognize extreme cases or know what to do for them. Furthermore, there are concerns around such issues as confidentiality and the payment for the specialist counselling that will often be required, and such informal workplace counselling does nothing to address difficulties other family members may be having.

These problems can best be addressed by having a formal employee assistance program (EAP) or, as they are increasingly called, employee and family assistance program (EFAP). A number of program types are available, including the referral-agent, management-directed, assessment-referral and comprehensive provider models. An example of the last is the program that has been offered at Key Lake since the early 1980s.

This EFAP has been used by 160 of about 425 workers, a higher rate than in most organizations. Two thirds are self-initiated referrals, while 16 percent are workplace-initiated; the time spent in the workcamp increases the likelihood of problems being recognized and referred. Two thirds of users are from the unionized labour force; 17 percent are supervisors and 15 percent are support staff. The primary problems are alcohol/drugs (38 percent), emotional (33 percent), marital (16 percent), families (11 percent) and financial (2 percent).

The formal benefits are unlimited, with the company paying the costs in a way which preserves the employee's anonymity. Two thirds use the program for three months or more, and the annual cost to the company is $30-$45 per employee. An evaluation of the program found that, six to twelve months after the referral, 92 percent were satisfied with the service the EFAP provided. In 90 percent of cases, the problem was thought to affect job performance and in 90 percent of cases, the problem had been resolved or reduced.

Long Distance Commuting Mining and Organised Labour

Terry Stevens

The organization of work and the workplace at long distance commuting (LDC) mines has meant that unions have had to give consideration to a wider range of work-related issues than is the case with conventional mining operations. Similarly, the LDC work pattern raises a number of issues related to the community and family life of workers, and unions have to pay attention to these if they are to fully represent the interests of their membership. For these reasons, unions and their representatives have to be both attentive to a

wider range of concerns and more open to innovative ways of addressing them than is the case at conventional mines.

In addition, LDC mines pose particular problems for unions in terms of organizing and operating a local and dealing with labour disputes. The mine site, including the workcamp and airstrip, is under company control, and the whole system serves to emphasize the influence of the manager. At any one time, a significant part (commonly half) of the workforce are at their homes in a large number of widely dispersed communities, while those at the mine are either at work or resting. Accordingly, access to the site has to be negotiated or achieved through a ministerial order, and it is often difficult to hold meetings, achieve group solidarity and provide union training. In the case of a dispute, it would be very difficult to picket or prevent the use of non-union labour, and there is no community of families and other dependents to provide moral and logistical support. Thus the organization of work is inherently divisive and antithetical to collective action, and significantly undermines the ability of workers to achieve fair wages and benefits and ensure safe working conditions.

This may help explain why there are only four organized LDC mines in Canada. Three of these are represented by the United Steelworkers of America (USWA): Key Lake (Saskatchewan), Detour Lake (Ontario), and Hope Brook (Newfoundland). The Cluff Lake (Saskatchewan) mine is represented by the Energy and Chemical Workers. These mines are among the larger LDC operations and, while they represent only 29 percent of all LDC mines, they account for 38 percent of the existing LDC labour force. However, this is still significantly lower than the overall figure of 50 percent to 60 percent for the mining sector labour force as a whole, as estimated by the Mineral Policy Sector of the Department of Energy, Mines and Resources.

Certainly, organizing any mine takes a considerable time, and the effort may be difficult to justify and/or achieve in the case of many LDC gold mines with short anticipated life-spans. In any case, the fact remains that LDC mines are mostly non-union, and that this form of work organization poses particular problems for unions.

Native Issues in Long Distance Commuting Mining

Bill Hanson

Resource development in the North demands a sensitive understanding of the development process and its effects on the local environment and its indigenous people. Commuter mining has been the subject of conflicting and disturbing messages from the Aboriginal people. One voice supports LDC as being essential to their future and that of their families. Another, often from

the same Native community, clearly states growing frustration with, and opposition to, commuting and other resource development initiatives in their region.

The immediate challenge this presents involves evaluating current initiatives, including LDC programs, against the needs of Native people. Through this process the mining industry can be more precise and effective in its efforts to respond to those who are moving towards participation in modern industrial society. More important, industry can better identify the cooperative process required to assist government agencies in identifying the needs, aspirations and capabilities of the more traditional Native people. However, this cannot be accomplished without meaningful dialogue and co-operation between industry, governments and the Native people.

Certainly, commuter mining solves the employment needs of some Native people but creates other problems which have negative impact on community life. The high incomes of commuter miners can disturb or destroy essential intra-group relationships, forcing the commuter to move to a larger centre. This creates problems related to social and cultural deprivation of family members, and the commuter may lose housing benefits. In some cases, these symptoms have been reduced by selective recruitment methods and counselling support programs. However, to fully understand and address the cause, an innovative and flexible framework is needed which can bring the two realities of the Aboriginal community into a balanced perspective.

Thus, future industry strategies must address two primary concerns. First, they must show the general public, and in particular Native people, that responsible resource development organizations have successfully responded to the employment needs of industrially oriented Native people. Secondly, they must provide a forum within which the needs, aspirations and capabilities of those Native people who remain bonded to a holistic, land-based, and subsistence-oriented way of life can be more precisely identified. Such an approach will serve to highlight what industry has accomplished (e.g. training, employment and LDC schemes, and support for Native businesses) and identify more clearly a development process which, because of its social, cultural and psychological implications, must take place beyond the direct influence or responsibility of the structured labour market.

In conclusion, the present array of employment-oriented initiatives, including commuting programs, must be continued with various forms of enrichment in order to satisfy the growing needs of industry-oriented Native workers. At the same time, with equal vigour and priority, new and innovative strategies required by those Native people who are seeking an alternative path must be implemented.

6. Community Issues - Panel

Are Federal/Provincial Government Programs a Help or Hindrance to Mining Communities?

Ken Donnelly

Mining communities across Canada currently have a golden opportunity to give to the federal government their ideas on what types of programming will work for them, and what will not. However, the mining communities must be proactive, because governments must be "on tap, not on top". In particular, the federal government can assist in four areas: information, planning, training and (limited) funding.

- Information: Employment and Immigration Canada (EIC) has started programs to help community groups find out who they are.

- Planning: there is now more opportunity for communities to design their own distinctive economic plans. No longer does the government assume that one model will work equally well in Goose Bay, Labrador and Drumheller. However, that does require that each community work to determine what model will work for them. LDC may play a part in this by allowing miners to continue to live in small rural communities.

- Training: increasingly, EIC is spending time providing training and support to volunteers participating in such programs as Community Futures, so that they can learn as much as possible about techniques of, and approaches to, community development. It is now recognised that community members cannot be expected to participate fully in planning development without the necessary tools and training.

- Funding: the current priority in this area is partnership, with communities having to find a local dollar. This can then be used to lever provincial and federal funds. Two ways that have been tried to generate local dollars are community bonds and municipal economic development bonds. The Nord Aski model in the Hearst region of

Ontario is an excellent example; each of five communities, including a band council, put $100,000 into a community development fund, and the provincial and federal governments each matched this with $200,000.

Long Distance Commuting from a Family Perspective

Phyllis Bray

The social implications of LDC are elusive and easy to ignore. Turnover, absenteeism, broken marriages, substance abuse, stress and depression can all be diagnosed and treated independently without the common cause being identified. However, ignoring the social consequences of the LDC system can be as damaging to an operation as poor financing, inadequate transportation or labour tensions.

Underlying the use of LDC is an assumption that workers will, between periods at the mine site, be able to return to a family home to rest and be cared for in preparation for the next hitch. In effect, the success of LDC depends on an invisible workforce at home, supporting the visible workforce at the mine. But research in the offshore-oil and mining industries suggests that this is problematic; the on-again-off-again schedule has serious social and psychological consequences for families, and the worker may return to the worksite not only more stressed out than when he left, but with unresolved problems remaining at home.

For the worker, LDC is an abnormal way of life, fluctuating between an isolated, high-pressure, extremely structured, macho work environment and an unstructured period in the haven of home and family. This swing can be highly disorienting. In the meantime, the wife has to try to maintain an illusion of a normal and self-sufficient household through an unrelenting and rapid cycle of transition. This requires combining a traditional role of caring and nurturing with periodic full responsibility for running the household. The nature of this adjustment may explain why research shows the LDC system generally to be more problematic for spouses than workers.

The system also has implications for children who may be subject to alternate and sometimes conflicting styles of family management and discipline. The lack of role models for this lifestyle is as problematic for children as their parents, and a lot of social support is needed if the intermittent single-parent status of the family is not to affect them adversely.

What needs to be done is to recognize the stresses that LDC places on workers and families, and plan ahead to make the adjustment as easy as possible. This includes the development of sensitive hiring policies and social supports, especially when dealing with the traditional nuclear families of breadwinner husband, homemaker wife and two or more children. It is these

families, especially when the couple is young, which tend to be least able to cope with LDC.

Alternatively, the industry might do well to seek to recruit among couples where both partners want to work, either before starting a family or after the children are old enough for only intermittent parental attention. Husband and wife teams might reduce stress at both the workplace and home. However, this strategy will have significant success only if fundamental changes are made in the workplace to make it gender-neutral. This will have to include changes in the work culture to eliminate macho attitudes and behaviour.

Commuting to the James Bay Hydro Project

André Allard

The Grand River, the main tributary on the Quebec side of James Bay, is a major source of hydro power generated in Quebec. The LG2 generation site, which is located 1500 kilometres from Montreal, is responsible for 20 percent of the energy produced in Quebec, and LG3 and LG4 combined are responsible for a further 20 percent of provincial production.

In total, 650 workers are employed at the LG2, LG3 and LG4 sites. Because of the isolation, a rotational commuting system has been adopted whereby, since the commissioning of the powerhouses, employees work 80 hours in fourteen days on an eight-days-on and six-days-off rotation. Workers are flown in by chartered Convair aircraft from Montreal, Rouyn-Noranda, Quebec City and Bagotville. Flights operate five days per week and in total there are approximately 60,000 passenger flights per year at an average cost of $140 per passenger. Workers at LG2 are provided with private rooms in residences in the community of Radisson and workers at LG3 and LG4 are housed on site. Transportation food, accommodations and recreation facilities are provided free; annual food costs alone total $5.1 million.

Employees work a ten-hour day from 7:00 a.m. to 5:30 p.m. Employees typically work 169 days a year; the remaining 196 days comprise 156 days off, 8 days of holidays, 16 extra days of holiday after one year and 16 days of statutory holidays. Hydro Québec finds little difficulty in recruiting workers to the site. The advantages to the work system are seen to be good working conditions, including wages, holidays and a distance bonus, and a good quality of life which includes high-quality and no-cost lodging, food and recreation. There are, however, disadvantages of the system, including the difficulties that young families in particular have in adapting to the rotation pattern.

Operating such a large project in an isolated area also calls for special management requirements. Given the need to address issues that range from

work-related matters to health, lodging, transportation and waste-processing issues, management has to be a continuous and multi-disciplinary process.

The costs of the 8/6 schedule are high and require an intricate management process; nevertheless, given the need to maintain a 365-days-per-year operation, Hydro Québec has found this rotation system to be very successful and expects to retain it for Phase II of the James Bay Project.

A Short History of Mining Communities

Robert Robson

Fly-in has only relatively recently been adopted as the method of choice for providing labour for remote mines; prior to this, mine development involved the construction of a new community. The process involved varied over time, as did the type of community that resulted. These variations can best be summarized in terms of four historical periods:

- 1880s-1914: a period of company dominance, with ad hoc and unplanned communities growing up around mines.

- 1918-39: an era when there was a greater concern about social issues, as reflected in planned communities. While the companies still dominated, there was a growing consideration of government concerns, and involvement on their part.

- 1945-70: a period of massive growth, with numerous planned mega-projects.

- 1970-present: the modern era. Crisis management, with the decline of towns like Pine Point and Lynn Lake. Two alternatives have been pursued to facilitate the resource production process: growth centres, and long distance commuting.

7. International Perspectives

Long Distance Commuting in the Mining Industry: An Australian Perspective

Rex Whiffen

Climatic conditions have resulted in the concentration of the Australian population in two widely separated coastal regions. Because of the general lack of towns in the vicinity of most mineral deposits, and the harsh climate, mining companies have increasingly turned to fly-in/fly-out for developing and operating metalliferous mines. A state capital, or sometimes a large regional town, is used as a base. This enables families to remain in their home towns and enjoy the benefits of larger communities and more moderate climates.

Long distance commuting operations have a number of social, industrial relations and economic advantages:

- Social: no mining town problems; less company intrusion in family life; less disruption of local social and biophysical environment; availability in larger centres of facilities, services and jobs for family members; lower cost of living in large centres; longer rest periods; and reduced commute road accidents.

- Industrial relations: skilled labour available in large centres; avoid labour force multiplier in mining towns; maintenance personnel not required on both shifts; and longer shifts and higher earnings.

- Economic: lower front-end cost; reduced absenteeism; less unionization; and smaller closedown effects.

However, there are also social, industrial relations and economic disadvantages:

- Social: family strains; 12-hour shifts can be stressful for some; and "fly-over" means there is little local employment benefit.

- Industrial relations: impact of unplanned absences of employees; high turnover, often based on a "planned" termination date; and some workers oppose the system.

- Economic: long-term operating costs are higher; transportation is expensive; and employers have to pay for travel time.

On balance, Australian mining companies have concluded that the fly-in/fly-out method is viable and preferable from social, economic and industrial relations perspectives when deciding on the type of operation best suited for remote locations. I suggest that the trend will continue in Australia, and that it will become more popular among workers as more of them become accustomed to the method of operation. Similarly, I believe that the union movement is already showing a greater understanding and acceptance of the method.

Global Economic Trends and Increases in Long Distance Commuting

Christopher Hinde

Although LDC is still the exception, it is not as rare as the scarcity of reports on it would suggest, and the current structure of the industry and the pressures placed on it by the investment community suggest a further increase in its use. This can be seen by examining the three things a company must have in order to enjoy a successful mining operation: an economic mineral deposit, project funding and an adequate labour force.

Economic deposit: two factors are of primary importance here, commodity and country considerations. In terms of the first, there has been a marked reluctance among international mining companies to explore for base metals in recent years, while spending on gold exploration has risen. Reasons for this include conservatism about investing in base metals ventures after the depressed prices in the early and mid-1980s, and the high capital costs and risks associated with base metals, as against gold mines, because of their greater size, more complex milling arrangements and longer lives.

Country considerations focus on the geological potential and political risk of individual nations. While the first does not change, perceptions of it do as new information and theories arise. In terms of political risk, this has diminished in (present and formerly) centrally planned economies in Eastern Europe, Africa, South America and Southeast Asia. Overall, a survey by the Hawaii-based East-West Center shows mining companies to be most

interested in large countries, many of which are sparsely populated and/or have few trained workers.

Project funding: the stock market has a bias towards the precious metals. This bias is reflected in both the funds available for projects and the cost of equity financing, and has led to a relative undervaluation of larger and longer-life operations. Instead, investors favour low-cost, short-life mines (typically surface gold mines) which minimize political risk and maximize short-term gain.

Labour: the problem of increased exploration in countries with sparse populations and/or few skilled workers, together with growth in labour costs (e.g. in South Africa), results in an increasing mechanization of operations.

To these mining-related issues should be added two socio-political factors. The first is the increased sophistication of society, which has tended to exaggerate the differences between typical mining towns and the more cosmopolitan lifestyles available in larger centres. The second, which may turn out to be the most influential influence on LDC over the next twenty years, is rising public concern about the environment, especially the impact of new mines in remote or protected areas. It will become progressively harder to obtain planning permission for large, long-life mining operations, with their attendant invasive technology. The benefits of small, highly mechanized operations, which high-grade the deposit and utilize skilled workers flown in from outside, will seem especially attractive to a risk-averse mining industry.

This will be a particularly strong factor in developed countries, and will augment the attraction of the developing nations. It will also mean that mining companies will find exploration increasingly advantageous in areas away from their headquarters.

8. Canadian Case Studies

Hope Brook, Newfoundland

Bill Fotheringham

Gold was discovered at the Hope Brook site by BP Exploration in 1982. Construction began in the spring of 1987. The first ore was obtained from an open pit while mill construction and underground development were in progress. The first gold was poured 27 August 1987. The capacity of the mill and underground mine was originally 3000 tonnes per day, but this has been improved and planning for 1991 is based on 3500 tonnes per day.

Hope Brook has a permanent workforce of about 300 people. Of these, about 275 work a 14/14-day rotation of 12-hour shifts at the minesite, and 25 administrative and management staff work out of the Corner Brook office on a five-day week, or at the minesite as required. Port aux Basques serves as a freight handling and expediting point for goods destined for the site, which is co-ordinated by one employee at this location.

Hope Brook is located about 80 km east of Port aux Basques on the southwest coast of Newfoundland. It is inland from Couteau Bay and adjacent to the Cinq Cerf River, a scheduled salmon river, as well as being within the wintering and calving range of the LaPoile caribou herd.

The short life expectancy of the operation (about 10 years), the inhospitability of the environment, the difficulty of providing community services, and the economic, physical and technical difficulties of providing highway access were the main factors that weighed against constructing a community.

The two-week rotation sees each crew and its respective first- and second-line supervision all on the same schedule, a system that is the result of several iterations and appears to be the best arrangement to date. The work pattern is, for many employees, better than that which they had been used to, as many had previously been working out of the province, often for long periods at a time.

Since the local terrain is unsuitable for an airstrip and the weather frequently prevents flying, access to the site is by sea from Port aux Basques. The *MV Cousteau Supplier* is a 1250-tonne ice-class vessel capable of making the five-hour trip from Port aux Basques with up to 49 passengers and 7 crew. There are four scheduled trips per week, with additional runs when required.

Completed scheduled trips have a success rate greater than 97 percent. In contrast, had the site been dependent on air transport, it is estimated that on-time departures would only have been in the order of 50-60 percent.

The permanent camp provides private single rooms with their own shower and toilet facilities. The accommodations for management and workers are identical. There is an emergency treatment centre and a registered nurse available 24 hours per day. A doctor in St. John's is on-call for consultation. Recreation facilities include a weight room, darts, pool, shuffle board, ping pong, video games, music, satellite television, and outside courts for basketball and tennis.

The corporate philosophy emphasizes fair and equal treatment for all employees, with the objectives of eliminating traditional barriers between management and workers and allowing workers to participate as stakeholders in the company. Until the recent unionization of employees, this philosophy was reflected in the fact that all employees were considered to be staff, and the salary and benefit programs were identical for the workforce and supervisors. Other personnel policies include family site-visits at Christmas, salaries at or ahead of the industry norm, an employee/management committee to develop and implement policies at the site, and a gainsharing plan to share productivity gains with the employees. The operation is organized; in early 1990 the United Steelworkers of America was certified to represent the workers.

Turnover rates are about 1 percent per month and absenteeism runs about 3-4 percent per month, including those on Workers' Compensation or long-term disability. Considerable effort has gone into developing and implementing a sophisticated safety program; however, not all of the desired results have yet been achieved. Whether this is related to long distance commuting is not known; internal communication problems, the large number of employees new to the mining industry, and problems associated with the start-up of a new operation are thought to be contributing factors.

In conclusion, long distance commuting has been, and continues to be a learning experience for the staff at Hope Brook, but whether it makes mining easier or more difficult is not clear.

Key Lake and Rabbit Lake, Saskatchewan

Michael Babcock

Rabbit Lake was Saskatchewan's first high-grade uranium mining operation. Since it opened in 1975, all other LDC mines in northern Saskatchewan have adopted its basic 7/7-day rotation pattern. Both Key Lake and Rabbit Lake use a fly-in system while Jasper, a gold operation, uses drive-in.

Rabbit Lake is located 800 km northeast of Saskatoon; the closest community is Wollaston Lake, about 40 km across the lake. A general shortage of labour, high turnover rates among personnel in conventional remote mining communities and a desire to encourage Native participation in the industry, and experience with the economic and social costs of opening and closing single industry communities, led to the use of a fly-in program.

Today 33 percent of the workforce at Rabbit Lake, 36 percent at Key Lake, and 49 percent at Jasper are classified as Northern Residents. Turnover for these employees is no greater than for any other group. Priority is given to applicants from North Central and Athabasca communities, with recruitment through Canada Manpower and NorSask Native Outreach offices located in nine northern communities.

Low educational levels preclude entry positions in technical trades and professional areas; hence, Cameco offers training programs to prepare northern workers for positions that become vacant. Originally, training was designed to attract workers into the operating departments of the mines, while more recently the program has been broadened to recruit northerners for maintenance jobs.

Cameco's goal is to employ 50 percent northerners by 1995. A shortage of professionally and technically trained northerners has resulted in the establishment of programs in these areas. On-the-job training in the mine and mill (including special programs to prepare individuals for supervisory positions) and off-site training at Buffalo Narrows, La Ronge, Stony Rapids and Flin Flon are all measures designed to achieve this employment goal.

At Cameco's operating sites, free single-room accommodations, meals and recreation facilities are provided. At Rabbit Lake and Key Lake, employees live in a permanent residential facility. At Key Lake, this includes a dining hall, gymnasium, racquetball courts, a recreation room, a bar/lounge, weight room, sauna and whirlpool, and a number of television lounges. Outdoor facilities include tennis courts, a curling rink and a softball diamond. Fishing and cross-country skiing are also easily accessible.

Virtually all Rabbit Lake and Key Lake employees live in Saskatchewan. They are flown into the site by chartered aircraft. Daily weekday flights operate from Saskatoon via Prince Albert, and northern communities are served two or three times per week. Employees work a 7/7-day rotation with 12-hour shifts. Operations managers work approximately three and a half days at their sites and the remainder of the week at the Saskatoon office.

Among the advantages of commuting is the ability of workers and their families to retain ties with family and friends and to take advantage of facilities and opportunities which may not be available in remote communities. Commuting also lowers the vulnerability of families to boom-bust cycles and mine closures. From the company's perspective, commuting is cheaper than developing and operating a mine town, and there is a saving in labour costs

due to lower absenteeism and turnover rates; in 1988 there was 11.9 percent turnover at Key Lake and 8.5 percent at Rabbit Lake.

While at the site, workers find few distractions from the job and there are few reasons for low productivity. In addition, the rotation and shift system reduces lost time, and longer work shifts have not resulted in increased accident rates. Commuting is not without its disadvantages. Some workers find the work pattern difficult to adjust to, and frequent partings and reunions can be stressful for family members.

Overall, however, workers prefer the advantages of commuting, and it has become the most favoured option from an industry standpoint. Should Cameco proceed with the Contact Lake gold mine 45 km northeast of La Ronge, the company would like to continue to use a 7/7 commuter system, where possible maximizing benefits to the area by hiring locally and purchasing from local communities.

Lupin Mine, Northwest Territories

Robert Armstrong

Lupin's use of LDC was based on the experience at Port Radium, which used a three-months-in/one-month-out schedule. All equipment at Lupin was designed to be flown in by Hercules freighter. Lupin workers spend 14 days at the site, followed by 14 at home. Currently, a company-owned Boeing 727-100 is used to fly passengers and freight to and from Yellowknife and Edmonton, with three return flights per week. It can be configured for 53, 58, 67 or 118 passengers, but in fact carries an average of 49 passengers plus 28,000 pounds of freight.

Echo Bay also operates a Twin Otter (for a northern commute network), a Lear 35 executive aircraft, and a Bell 206L helicopter (used, among other things, in the construction and operation of a winter road to the minesite). These aircraft are operated out of joint Echo Bay/Shell Oil Aerocentres at Yellowknife and Edmonton. This system is cost-effective and dependable, with high-quality pilots and mechanics. There are, on average, only two delays per year, and there has never been a cancellation. However, thought is being given to joint-venturing the aircraft.

The winter road between Yellowknife and the minesite at Contwoyto Lake is 661 km long. The mine employs 45 people on a three-weeks-in/one-week-out schedule. Building and maintaining the road costs $4.9 million to $5.5 million per year.

In 1990, the operation employed 334 people at the mine (123 in the mine and 80 in the mill) and 22 support staff in Edmonton. The most common province of residence is Alberta (the home of 58 percent), followed by British

Columbia (16 percent), Northwest Territories (12 percent), Saskatchewan (8 percent), Manitoba (3 percent), Ontario (2 percent), and Quebec, Yukon and New Brunswick (less than 1 percent each). Within the Northwest Territories, the most common places of residence are Coppermine (where a human resources worker is located), Yellowknife and Cambridge Bay. The workforce is 93 percent male.

The accommodations have 254 single and 70 double rooms; accommodations and subsistence costs average $23 per worker per day. To date in 1990, there is an 8.4 percent turnover rate and a 3.5 percent absenteeism rate. Forty-four percent of employees have over five years' service.

The mine is non-unionized, a factor which contributes to safety because there are closer contacts between workers and management. The LDC system results in rumours being common, but the two-week pattern helps limit this and ensures regular opportunities to get away. The social impacts vary according to the worker's marital status.

Territorial labour legislation is based on a 40-hour work week which is incompatible with the 14/14-day system used at Lupin. As a result, the company must seek special exemptions from the legislation.

9. LDC Mining: Saskatchewan Experiences

Ray Clayton, Assistant Deputy Minister, Saskatchewan Energy and Mines

Saskatchewan has had one experience of a single-mine town in recent decades. Uranium City was established in the early 1950s. A new town was developed because of the remoteness of the ore deposits, and it became the largest community in northern Saskatchewan. At its peak of prosperity, the town had a population of over 3,000, a wide range of businesses, and excellent education, hospital and recreation facilities. The mine closed in 1982 because of depletion of the economic ore. The town now houses about 200 people, most of whom are unemployed. The consequences of the mine closure included the disruption of many lives and severe financial losses.

Recent experiences of uranium mining have been more positive. Three mines started production in the mid-1970s and early 1980s, and all are commuter operations. The first, Rabbit Lake, was developed when there were labour shortages and high staff turnover. Several factors worked against the use of a townsite, including social problems associated with isolation, the poor education facilities at townsites, concerns about company domination of a community, and the difficulties in attracting Native people to work there. A commuter system, in contrast, was thought to give a higher quality of home life, to facilitate the training and hiring of natives, and to produce fewer problems when the operation reached the end of its economic life.

Cluff Lake followed the example of Rabbit Lake, supported by the findings of a Board of Inquiry. It was discovered that, among other things, Rabbit Lake miners liked the commute system, the short separations from work and home, and the fact that existing communities were not stripped of their citizens. By the time Key Lake was being planned in the early 1980s, commuting was the accepted method of operating remote mines in northern Saskatchewan.

The question now is: What is remote? A case in point is the Contact Lake gold mine in La Ronge Provincial Park. This will employ about 100 people during construction and operation, with an estimated life of five years. It is located in a high-unemployment area which includes the communities of La Ronge, Missinipe and Stanley Mission. The operator, Cameco, wants to use a 7/7-day commute from local communities (but not the larger and more distant communities of Prince Albert and Saskatoon) and is committed to 33

percent use of northern residents at start-up, rising to 50 percent by 1995. They argue that a commute system will be consistent with industry trends, be preferred by employees, reduce absenteeism, and avoid the highway safety problems and time wastage of a daily commute. However, the Town of La Ronge believes a daily commute is preferable because it would minimize fly-over effects, allow workers to integrate more into local communities, and result in increased property values.

The internal review of the project's Environmental Impact Assessment is under way and public discussions will start shortly. There are numerous points of view, factors, and considerations involved when looking at this operation and others which use long distance commuting. The Department of Energy and Mines hopes that collective wisdom will be applied to allow resources to be developed in ways which maximize benefits for individuals and their families while enhancing the quality of life in their communities.

10. Workshop Report Summaries

Workshop #1: Community and Public Policy Issues

In response to common interests among participants, this session combined two planned workshops: Public Policy Issues and The Future of Northern Communities. Conclusions and recommendations were reached in three main areas: the involvement of northerners in LDC, spin-off benefits and costs, and the implications for public policy.

Involvement of Northerners:

- The main players in dealing with LDC are the mining companies, workers, communities and governments;
- to date, attempts to involve northerners have had mixed success;
- only a small proportion of any northern or other population will want to, or be able cope with, work at a fly-in mine;
- most employees have their own employment goals which should be recognized and responded to;
- northern hiring quotas are ineffective; it is better to set targets;
- the relatively high incomes of LDC workers may be resented and cause social disruption in small northern communities. This may lead to an out-migration of workers and their families;
- the industry should not try to solve all the problems of Native northerners, but should focus on those things that Native people do well;
- rivalries between different Native bands must be recognized and dealt with;
- the success of initiatives must be periodically evaluated.

Spin-Offs:

- LDC allows wages to benefit the economies of northern communities if the communities are used as a source of labour;
- LDC avoids the need to provide major infrastructure in new or existing communities in the event of a new mine opening;
- LDC reduces the community impacts of mine closures;
- LDC workers are able to continue to live, part-time, with their family and friends, which could help to stabilize communities;
- existing communities could be developed as centres supporting LDC operations.

Public Policy Implications:

- There are no standard solutions; each case is unique.

Workshop #2: Human Resource Issues

The issues reviewed in this workshop covered a wide range. Both general and specific recommendations were developed to deal with issues in a number of areas. There was a strong consensus at the workshop in favour of the recommendations listed below. However, there were one or two dissenters on some issues (for instance, one participant argued strongly for a "dry" camp). It was also generally recognized that while all of the following recommendations are desirable, the scope for implementing some of them will be limited at small, short-life operations.

General Recommendations:

- Operations managers and human resource personnel at Canadian LDC mines should hold annual meetings to review the types of issues discussed in this workshop;

- there are no simple solutions; policies and practices must be developed and revised in response to particular circumstances. Flexibility is crucial;

- governments should be pressured to amend legislation (e.g. with respect to hours of work) to make it more adaptable to LDC operations;

- attempts should be made to hire more Aboriginals and women for LDC operations. Representatives of these groups should also be involved in planning the operations, setting targets, and improving educational levels as well as generating interest in mining work.

Specific Recommendations:

Social Impacts

- Suggested initiatives include the use of videos to provide information on LDC work and its impacts; family site visits; better, more private, and subsidized telephone links; special leaves at Christmas; employment of couples; and the establishment of family social support networks (using newsletters, etc.).

Transportation

- Alternative transportation arrangements (e.g. scheduled flights, charters, company-owned aircraft) and pick-up points should be carefully evaluated.

Rotations and Schedules

- Careful planning should balance company and employee considerations, including the implications of Native lifestyles.

Alcohol

- Careful planning is needed, especially as it is difficult to change policies once they have been established;

- the rules must be clear, and significant infractions must be dealt with firmly and fairly;

- most workshop participants favoured a "wet" camp in the form of an employee-operated tavern with restricted hours of operation; this was thought to provide a more home-like camp atmosphere and reduce binge drinking when at home.

Counselling

- All LDC mines should have an Employee and Family Assistance Program (EFAP);
- existing provincial and territorial support services should be reviewed and used where appropriate;
- where there are Native employees, appropriate counselling opportunities should be available for them.

Camp Facilities

- High-quality accommodations were considered critical; in the words of one workshop participant, "work out what you can afford to spend on accommodations and then spend twice that";
- the camp environment should be as "home-like" and as similar as possible to life elsewhere, in terms of the physical environment, social environment, labour force composition, and lack of regimentation;
- high-quality, active and passive recreation facilities should be provided;
- employees should have a room of their own during their periods on site;
- special arrangements should be made for housing women and couples;
- country foods should be provided at operations employing Aboriginals.

Labour Pool and Hiring Practices

- The potential labour pool should be carefully assessed when setting up an operation;

- affirmative action and training programs should be used to facilitate the hiring of Aboriginals and women;

- there should be an active corporate relations program (including school visits) in nearby communities, and the communities themselves should be involved in the establishment of hiring procedures;

- where feasible, pre-hiring orientation should be used to make workers (and, ideally, their spouses) aware of the impacts of the system.

Education and Training

- There should be clear and comprehensive policies and programs on hiring standards, education and skills upgrading.

Compensation and Benefits

- Consideration should be given to travel pay and to special non-cash benefits;

- the taxation impacts of LDC should be reviewed.

Organizational Structure

- Careful organizational planning is required, and is even more critical than at conventional operations;

- back-up, continuity and overlap are key issues, and must be handled with care and flexibility: what was optimal last month will not necessarily be so now.

Establishing Personnel Policies

- Establish personnel policies at the outset, and have a clear procedures manual;

- develop procedures on the basis of experience; find out what others have done and learn from it.

Workshop #3: Planning and Managing a Fly-In Operation

This workshop reviewed a broad range of issues related to establishing and operating a fly-in mine. There was general agreement on the following observations and recommendations.

Hiring Practices:

- The manager, and especially the initial manager who helps set up the operation, is crucial to its success. The manager sets the culture of, and attitudes at, the mine; it is best to have a single "boss" with an assistant, rather than a manager for each rotation;
- it is important to hire good people and let them know clearly what their jobs are;
- screen for the "ideal" employees; all those being considered for hiring should be interviewed to see whether they will be able to cope with the fly-in system;
- the most suitable candidates will usually be technically oriented people in their mid- to upper-thirties;
- those with previous experience of this type of schedule (in mining, offshore oil, merchant marine, etc.) and those recommended by current workers are also more likely to be good employees;
- training programs should be established early in the planning of an operation;
- a Native coordinator is necessary to provide pre-employment training and community support for Native employees;
- political boundaries may create problems when hiring Native people.

Government Legislation:

- The industry must communicate to government its requirements concerning long distance commuting. Appropriate legislation can then

be drafted with respect to such considerations as "hours-of-work" regulations;

- LDC requires flexibility on the part of both industry and government.

Work Schedule:

- A seven-day module is best for both management and employees. It is the most compatible schedule with the other commitments of aviation charter companies;
- a 3/4-day cycle is also acceptable, since it works within a seven-day module;
- it is crucial that a consistent schedule be established and maintained, and that the transportation system be reliable;
- LDC schedules generally seem to be compatible with Native lifestyles.

Cost-Effectiveness:

- Fly-in is highly cost-effective, as indicated by its success in Australia, which has high aviation costs.

Responsibility for Aviation Infrastructure:

- Mine operators should provide and maintain infrastructure themselves;
- the government's role should be to provide regulatory checks.

Emergency Planning:

- There must be on-site preparedness, with regular emergency exercises;
- practical on-site training must be provided to staff; nurses, first-aid staff and others should have higher levels of training than at a conventional mine;

- medical and medevac back-up must be available;
- good communications must be provided within the site and with the outside world;
- satellite telemedicine support has considerable potential.

Safety:

- Long shifts and rotations do not seem necessarily to affect safety;
- on-site counselling should be available for those with drinking and other problems.

Unions:

- Non-union operations are safer and better, in part because there are better communications within the workforce and a less confrontational atmosphere;
- many traditional union concerns (e.g. wages, benefits, site facilities) are fully addressed by management at fly-in mines;
- fly-in mines generally have better management and greater workforce equality than conventional mines;
- non-union mines require very careful management since the manager must be receptive to issues normally addressed by unions.

Native Employment:

- Employing Native people from different bands and communities is not generally problematic;
- companies should upgrade the basic education skills of Native workers when necessary for advancement.

Appendix: List of Conference Participants

André Allard
Gèrant, Secteur LG2
Hydro Québec

Denis Anderchek
Manager, Human Resources
Neptune Resources Corporation

Robert Armstrong
Vice President
Mining & Technical Services
Echo Bay Mines Ltd

Michael Babcock
Vice President, Mining
Cameco

Maurice Berens
Southeast Resource Development Corp

Robert Bone
Professor, Dept. of Geography
University of Saskatchewan

Phyllis Bray
Independent Researcher
Order of Sancta Barbara

Ralph Cheesman
Manager-Consultant
Saskatchewan Mining Association

Dennis Coates
Senior Consultant
Personnel Performance Consultants

Terry Daniels
Senior Regional Advisor
Energy, Mines and Resources Canada
Nova Scotia

Richard Dénommé
Agent Communication
Hydro Québec

Geoffrey Dodge
Deputy State Mining Engineer
Department of Mines, Australia

Ken Donnelly
Assistant Manager
Canadian Rural Transition Program
Employment and Immigration Canada

David Drake
Mine Manager, Dona Lake Mine
Placer Dome

Raymond Duret
Personnel Superintendent
Cigar Lake Mining Corporation

Bill Fotheringham
General Manager
Hope Brook Gold Inc.

Maureen Gammell
Analyst
Saskatchewan Energy and Mines

François Gay
Conseiller
A.P.S.M.

Clare Gitzel
Human Resources Manager
Amok/Cluff Mining

Lloyd Gould
Mining Inspector/Mine Training
Government of the N.W.T.

Bill Hanson
Director, Interprovincial
Association on Native
Employment

Roderic Hill
Manager, Mineral Resources
Program
Government of Yukon

Christopher Hinde
Editorial Director
Mining Journal Limited

John Hopkinson
Manager, Salaries & Manpower
Cominco Limited

Jacques Hudon
Director of Public Affairs
The Mining Association of Canada

David Johnston
Vice President, Mine Operations
Cominco Metals

Tony Keen
Manager, Polaris Operations
Cominco Limited

Glenn Kendall
Acting Director, Mineral Policy &
Planning Division
Energy, Mines & Resources
Canada

Brian Leece
Senior Mining Engineer
Oslo Alberta Limited

Norman Lightfoot
Consultant
Aviation Planning

Carmen Loberg
Director, Charter Operations
Time Air Incorporated

John Mahon
Human Resource Superintendent
Detour Lake Mine
Placer Dome

Mary Louise McAllister
Assistant Director
Centre for Resource Studies

Irene McGunigal
Vice President
LaRonge & District Chamber of
Commerce

William McIlwaine
Development Economist
Ontario Ministry of Northern
Development & Mines

Mark Millin
Human Resources Superintendent
Golden Bear Operating Company

Doug Paget
Senior Resources Development Advisor
Dept. of Indian Affairs & Northern Development

Thomas Pugsley
Director
Falconbridge Limited

Norman Ringstead
B.C. Mine Development Review Process

Richard Robertson
Engineering Manager
BHP-Utah Mines

Robert Robson
Assistant Professor
Department of History
University of Winnipeg

Kathy Rohacek
Manager Recruiting
Falconbridge Limited

Carol Rowlett
Administration Officer
Northern Affairs, Saskatchewan

Bernie Scott
Socio-Economic Advisor
Energy, Mines & Petroleum Resources
Government of the N.W.T.

Mark Shrimpton
Senior Research Fellow
Institute of Social and Economic Research
Memorial University of Nfld

Don Somers
Principal
Peat Marwick Stevenson & Kellogg

Alison Stickland
Assistant Secretary
Northern Affairs Secretariat

Keith Storey
Director, Offshore Research Project
Institute for Social and Economic Research
Memorial University of Nfld

Ron Sully
Assistant Deputy Minister
Mineral Policy Sector
Energy, Mines and Resources Canada

Lynn Townsend-Anderson
Regional Manager
Communications Branch
Energy, Mines and Resources, Saskatchewan

Wayne Wagner
Senior Regional Advisor
Energy, Mines and Resources Canada
Nova Scotia

Bernie Welke
Staff Representative
United Steelworkers of America

George Werniuk
Billiton Metals Canada Inc.

Rex Whiffin
Executive General Manager
Australian Mines & Metals
Association

John Willson
President and C.E.O.
Pegasus Gold Corporation

Douglas Willy
Manager, Human Resources
Echo Bay Mines Limited

Margot Wojciechowski
Executive Director
Centre for Resource Studies

Mykel Ziolo
Manager, Organization, Staffing
& Development
BHP-Utah Minerals International

The Centre for Resource Studies

The Centre for Resource Studies (CRS) was established in 1973, under the sponsorship of Queen's University, the federal Department of Energy, Mines and Resources, and The Mining Association of Canada, to carry out a program of research and publication on mineral policy issues.

The Centre provides opportunities for multidisciplinary research in resource studies at Canadian universities, furnishes reliable information on matters related to mineral resource policy, and promotes closer liaison between government, industry and other concerned groups. The research program is carried out both at the Centre and by means of contracts with qualified investigators, usually at Canadian universities. Small exploratory studies are also funded, through a system of grants-in-aid of research. CRS Policy Discussion Seminars involve representatives from governments, industry, universities, labour, and other interested groups in working sessions on issues of current concern. Through this program of research and seminars, and the resulting publications, the Centre contributes to informed discussions and a better understanding of significant issues.

The Centre is governed by a Board of Directors which establishes general policy and priorities for research. The chairman is Dr. C.G. Miller and the executive director is Mrs. Margot Wojciechowski. There are sixteen Directors – nine nominated by Queen's University, four by The Mining Association of Canada, and three by the federal government. Guidance on the research program, together with discussion of policy issues and other matters, is provided by the Advisory Council. This body comprises all researchers associated with the Centre, together with members appointed from such groups as governments, industry, labour, and other interests. A Research Advisory Committee aids in the development of projects and the selection of research proposals. The executive director and staff are responsible for the work of the Centre within this framework.

Most of the funding for the Centre's activities is provided by the sponsors. In addition, the Centre accepts contracts from other organizations interested in mineral policy research.

List of CRS Publications

Monographs

M 26 **Uranium Mining in Canada and Australia: The Impact of Taxation**, by B.W. Mackenzie, R.T. Whillans, R.M. Williams, and M.D. Doggett, 199 pp, 1991

M 25 **U.S. Trade Barriers and Canadian Minerals: Copper, Potash and Uranium**, by D.C. Haglund and A. von Bredow, 211 pp, 1990

M 24 **Federal and Provincial Taxation of the Canadian Mining Industry: Impact and Implications for Reform**, by R.W. Boadway, K.J. McKenzie, and J.M. Mintz, 207 pp, 1989

M 23 **Metals Demand and the Canadian Metal Industry: Structural Changes and Policy Implications**, by C. Nappi, 145 pp, 1989

M 22 **Pricing of Metals**, by M.E. Slade, 149 pp, 1988

M 21 **Mining Potential in Northern and Southern Canada: Guidelines for Regional Development Policy**, by L.J. Vertcun, and B.W. Mackenzie, 225 pp, 1988

M 20 **Canada and International Mineral Markets: Dependence, Instability, and Foreign Policy**, by M. Webb and M. Zacher, 194 pp, 1988

M 19 **The Korean Mineral Market: Opportunities and Marketing Strategies for Canada**, by O.Y. Kwon, 177 pp, 1987

M 18 **An Analysis of Japanese Coking Coal Procurement Policies: The Canadian and Australian Experience**, by D.L. Anderson, 221 pp, 1987

M 17 **Canadian Mineral Policy Past and Present: The Ambiguous Legacy**, by D. Yudelman, 192 pp, 1985

M 16 **National Resources and International Bargaining Power: Canada's Mineral Policy Options**, by P.J. Caragata; 190 pp, 1984

M 15 **Financing Canadian Mining in the Eighties: Strategies for Action**, edited by D. Yudelman; 240 pp, with papers by B. Bradley, A. Dorland, J. Erola, P. Gillin, S. Greenwald, B. Kalymon, P. MacCulloch, B. Mackenzie, K. Murphy, A. Powis, R. Sultan, and D. Yudelman, 1984

M 14 **Foreign Investment Control in the Canadian Mineral Sector: Lessons from the Australian Experience**, by D.L. Anderson; 180 pp, 1983

M 13 **Profitability in the Canadian Mineral Industry**, by C.H. Pye; 178 pp, 1981

M 12 **The Role of Mineral Taxation in Industry/Government Conflict: The Case of the Saskatchewan Potash Reserve Tax**, by D.L. Anderson; 135 pp, 1981

M 11 **The Impact of Policy Change on Decisions in the Mineral Industry: The Case of Exploration in Manitoba, 1969-77**, by B.E. Owen and W.J. Kops; 116 pp, 1980

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M 8 **Environmental Impact of Mining in Canada**, by E.A. Ripley, et al; 274 pp, 1978

M 7 **Economic Impacts and Linkages of the Canadian Mining Industry**, by P.E. Nickel, et al; 140 pp, 1978

M 6 **The Canadian Nonferrous Metals Industry: An Industrial Organization Study**, by E. Urquhart; 158 pp, 1978

M 5 **Health and Safety in the Canadian Mining Industry**, by G.W. Gibbs and P. Pintus; 248 pp, 1978

M 4 **Human Resources in Canadian Mining: A Preliminary Analysis**, by J.A. MacMillan, G.S. Gislason, and S. Lyon; 174 pp, 1977

M 3 **The Transportation Impact of the Canadian Mining Industry**, by A.I. Wallace; 154 pp, 1977

M 2 **The Impact of the Mining Industries on the Canadian Economy**, by R.W. Boadway and J.M. Treddenick; 116 pp, 1977

M 1 **Conflict and its Resolution in the Administration of Mineral Resources in Canada**, by R.M. Burns; 62 pp, 1976

EAS 9 **A Climate for Change: Alternatives for the Central and Eastern Arctic**, by K.A. Graham, M.P.S. Brown, A.B. McAllister, and M.J. Wojciechowski. Final Report of the Eastern Arctic Study, 198 pp, 1984

Proceedings

P 24E **Long Distance Commuting in the Mineral Industry: Conference Summary**, edited by M. Shrimpton and K. Storey, with papers by K. Storey and M. Shrimpton, N. Lightfoot, L. Gould, J. Hopkinson, C. Loberg, C. Gitzel, J. Willson, D. Coates, T. Stevens, B. Hanson, R. Robson, K. Donnelly, P. Bray, A. Allard, R. Whiffen, C. Hinde, B. Fotheringham, M. Babcock, R. Armstrong, and R. Clayton, 57 pp, 1991

P 24F **Conférence sur le transport sur de longues distances des travailleurs de l'industrie minière: Précis des exposés et des travaux d'atelier**, publié sous la direction de M. Shrimpton et K. Storey, avec présentations par K. Storey et M. Shrimpton, N. Lightfoot, L. Gould, J. Hopkinson, C. Loberg, C. Gitzel, J. Willson, D. Coates, T. Stevens, B. Hanson, R. Robson, K. Donnelly, P. Bray, A. Allard, R. Whiffen, C. Hinde, B. Fotheringham, M. Babcock, R. Armstrong, et R. Clayton, 74 pp, 1991

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P 21 **Prospects for Minerals in the 90s**, edited by P.R. Richardson and R. Gesing, with papers by P.R. Richardson, N. Keevil Jr., J. Macleod, J. Cordes , S. Hunt, J. Zwartendyk, P. Perron, P. McGeer, B. Harris and A. Cecutti, and R. Gesing and M.J. Wojciechowski, 149 pp, 1988

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P 19 **Technology Policies in the Canadian Mineral Industry**, edited by M.J. Wojciechowski, with papers by R. Woodbridge, M.J. Wojciechowski, F. Pickard, D. Bevelander, J. Hood, W.G. Jeffery and J. Kuryllowicz, P. Richardson, J. Schade, W. Curlook, and G. Miller, M. Sayer, G. Hatch, D. Hutchinson, and A. Molinari, 179 pp, 1986

P 18 **Structural Changes in the World Mineral Industry: Implications for Canada**, edited by M.J. Wojciechowski, with papers by P. Crowson, S. Hunt, G. Haclin, J. Davies, D. Karvonen, G. Denis, D. Daly, D. Haglund, I. Bennett, G. Mahoney, K. Buck, 213 pp, 1986

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